

In the Claims

1 1. (currently amended) A photonic crystal waveguide for coupling with optic
2 devices comprising:
3 a planar photonic crystal slab in which an array of holes is defined; and
4 a waveguide defined by a line defect defined in the array of holes in said slab,
5 said line defect being created by a geometric perturbation of at least a first set of holes
6 in the array with respect to a second set of holes in the array to create at least one
7 guided mode of light propagation in said waveguide which exhibits reduced vertical and
8 lateral losses, increased coupling of light into said slab, and closer matching of
9 frequencies of eigen modes of said optic devices coupled to said waveguide.

1 2. (original) The waveguide of claim 1 where said geometric perturbation is a
2 positional displacement of said first set of holes with respect to said second set of holes
3 in a predetermined direction, said first and second set of holes having the same
4 diameter of hole therein.

1 3. (original) The waveguide of claim 1 where said predetermined direction is the ΓX
2 direction in said slab, said waveguide being defined as a type 1 waveguide.

1 4. (original) The waveguide of claim 1 where said predetermined direction is the ΓJ
2 direction in said slab, said waveguide being defined as a type 2 waveguide.

1 5. (original) The waveguide of claim 4 where said positional displacement, d , is a
2 fraction, l , of lattice spacing, a , of said array, $d = l \cdot a$, where $0 < l < 1$.

1 6. (original) The waveguide of claim 5 where $d = 0.5a$.

1 7. (original) The waveguide of claim 5 where said waveguide has a bandgap and
2 where d is reduced until both acceptor-type modes and donor-type modes are
3 positioned in the bandgap of said waveguide.

1 8. (original) The waveguide of claim 1 where said slab has a bandgap, an air band
2 and a dielectric band for propagation of modes and where said geometric perturbation is
3 created by displacement of holes into a positions within said array of holes where
4 dielectric is normally present to pull modes from the dielectric band into the bandgap.

1 9. (original) The waveguide of claim 1 where said slab has a bandgap, an air band
2 and a dielectric band for propagation of modes and where said geometric perturbation is
3 created by displacement of dielectric into a positions within said array of holes where air
4 is normally present to pull modes from the air band into the bandgap.

1 10. (currently amended) The waveguide of claim 1 where said geometric
2 perturbation is created by increasing or decreasing the diameter of ~~a~~the first set of
3 holes in said array of holes relative to ~~a~~the second set of holes comprising a remainder

4 of holes of said array, said first set of holes being adjacent at least in part to said line
5 defect, said waveguide defined as a type-3 waveguide.

1 11. (original) The waveguide of claim 10 where slab has a bandgap and an air band
2 and where second set of holes has a radius, $r = 0.3a$ and said first set of holes has a
3 radius, $r_{\text{defect}} = 0.2a$ and said array of holes has a triangular lattice so that only air band
4 modes are pulled down in the bandgap and no acceptor-type modes are present.

1 12. (original) The waveguide of claim 10 where slab has a bandgap and an air band
2 and where second set of holes has a radius, $r = 0.3a$ and said first set of holes has a
3 radius, $r_{\text{defect}} = 0.45a$ and said array of holes has a triangular lattice so that only
4 acceptor-type modes are present.

1 13. (original) The waveguide of claim 1 where said light is guided in said waveguide
2 due to photonic bandgap (PBG) effect.

1 14. (original) A method for defining a photonic crystal waveguide for coupling with
2 optic devices comprising:
3 defining an array of holes in a planar photonic crystal slab; and
4 creating a line defect in said slab to define said waveguide, said line defect being
5 created by a geometric perturbation of at least a first set of holes with respect to a
6 second set of holes to create at least one guided mode of light propagation in said

7 waveguide which exhibits reduced vertical and lateral losses, increased coupling of light
8 into said slab, and closer matching of frequencies of eigen modes of said optic devices
9 coupled to said waveguide.

1 15. (original) The method of claim 14 where creating said line defect comprises
2 forming said first set of holes displaced in a predetermined direction with respect to said
3 second set of holes, said first and second set of holes having the same diameter of hole
4 therein.

1 16. (original) The method of claim 14 where forming said first set of holes displaces
2 said holes in the ΓX direction in said slab, said waveguide being defined as a type 1
3 waveguide.

1 17. (original) The method of claim 14 where forming said first set of holes displaces
2 said holes in the ΓJ direction in said slab, said waveguide being defined as a type 2
3 waveguide.

1 18. (original) The waveguide of claim 17 where forming said first set of holes
2 displaces said holes by a displacement, d , is a fraction, l , of lattice spacing, a , of said
3 array, $d = l \cdot a$, where $0 < l < 1$.

1 19. (original) The method of claim 18 where forming said first set of holes displaces
2 said holes by a displacement, $d = 0.5$.

1 20. (original) The method of claim 18 where said waveguide has a bandgap and
2 where forming said first set of holes displaces said holes by a d which is reduced until
3 both acceptor-type modes and donor-type modes are positioned in the bandgap of said
4 waveguide.

1 21. (original) The method of claim 14 where said slab has a bandgap, an air band
2 and a dielectric band for propagation of modes and where creating said line defect
3 comprises forming said first set of holes displaced by displacement of holes into
4 positions within said array of holes where dielectric is normally present to pull modes
5 from the dielectric band into the bandgap.

1 22. (original) The method of claim 14 where said slab has a bandgap, an air band
2 and a dielectric band for propagation of modes and where creating said line defect
3 comprises forming said first set of holes displaced by displacement of holes into
4 positions within said array of holes where air is normally present to pull modes from the
5 air band into the bandgap.

1 23. (currently amended) The method of claim ~~4~~14 where creating said line defect
2 comprises increasing or decreasing the diameter of a ~~the~~the first set of holes in said array

3 of holes relative to a the second set of holes comprising a remainder of holes of said
4 array, said first set of holes being adjacent at least in part to said line defect, said
5 waveguide defined as a type-3 waveguide.

1 24. (original) The method of claim 23 where slab has a bandgap and an air band and
2 where creating said line defect comprises decreasing the diameter of a first set of holes
3 to a radius, $r_{\text{defect}} = 0.2a$ and said second set of holes has a radius, $r = 0.3a$ and said
4 first set of holes has said array of holes has a triangular lattice so that only air band
5 modes are pulled down in the bandgap and no acceptor-type modes are present.

1 25. (original) The method of claim 23 where slab has a bandgap and an air band and
2 where creating said line defect comprises increasing the diameter of a first set of holes
3 to a radius $r_{\text{defect}} = 0.45a$, where second set of holes has a radius, $r = 0.3a$, and said
4 array of holes has a triangular lattice so that only acceptor-type modes are present.

1 26. (currently amended) The method of claim 4 14 where creating said line defect
2 comprises guiding light in said waveguide solely due to photonic bandgap (PBG) effect.